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Abstract

Business process outsourcing (BPO) is expected to be "the next big wave" in the development of information technology services. However, managing the tacit knowledge underlying the interfaces is costly and complicated. Modularization of the outsourced business process can mitigate such complexity and the risk of knowledge misappropriation. This research-in-progress paper introduces the concept of modularization of outsourced business process (MOBP), which is viewed as the operational concept of "modular global sourcing" proposed by Infosys, a leading Indian outsourcing provider. Standing the position of the client firm, we examine the antecedents and consequents of MOBP based on transaction cost economics theory and knowledge-based theory. We explore the impacts of process human asset specificity, environmental uncertainty, behavioral uncertainty, small-number trading, strategic criticality of process knowledge, and process knowledge ambiguity on the extent of MOBP and also the impacts of MOBP on cost reduction and knowledge spillover. This paper also describes the research plan to test the research hypotheses. Contributions to research and practice are highlighted.

Keywords: Business process outsourcing, modularization, transaction cost economies theory, knowledge-based theory, cost reduction, knowledge spillover

Introduction

In recent years, business process outsourcing has got a rapid development. According to Gartner, worldwide BPO services reached the market size of 173 billion in 2007, among which offshore BPO accounted for about 15% (Tanriverdi, Konana and Ge 2007). BPO means the delegation of one or two more IT-intensive business processes to an external service provider, who owns, administers and manages the processes, while offshore BPO is outsourcing business processes to a service provider from a country that is geographically remote from the client enterprises (Stone 2004). Business process outsourcing (BPO) is expected to be "the next big wave" in the development of information technology services (Yang, Kim, Nam and Min 2007). Firms are increasingly sourcing service globally and relying on offshore BPO partners because of competition globalization (Mehta, Armenakis, Mehta and Irani 2006). Under the current global financial crisis, to reduce cost, improve operational efficiency, and achieve flexibility, more Euramerican and Japanese companies intend to source their non-core business in developing countries with lower production costs. According to McKinsey & Company's research report, more than 95% global Fortune 1000 companies have developed service outsourcing strategy; it is estimated that by 2010, global service outsourcing market will reach more than 600 billion U.S. dollars.

Vendors are promoting their unique service models for catering to the globalization trend of BPO. Infosys, for example, promoted the strategy of "modular global sourcing" and Global Delivery Model (GDM), which "applies the fundamental concepts of modularization to business process and IT application and infrastructure services sourcing decision making, implementation, and ongoing management" (Infosys 2007). Wipro, a major competitor, also promises to "assist in development, implementation and support of modular, scalable and global enterprise resource planning (ERP), B2E, B2C, B2B, B2Bi and E2E solutions catering to extended enterprise (Wipro 2007). Founder Technology, a noted Chinese vendor, has promoted professional outsourcing services of whole processes and firstly provides optional outsourcing services driven by a modular menu, through which the client could freely elect the activities to outsource based on its own situation. In BPO, modular global sourcing is an important trend.

However, BPO doesn't ensure the firms achieve the intended goals due to its inherent risks. The one major problem with BPO is that the cost of managing the tacit knowledge residing in the interfaces between the client and the vendor may outweigh the benefits from outsourcing. The situation is much worse when the firm builds the outsourcing alliances with two or more vendors. Although all the individual outsourced processes have met the client's respective design specifications, they may not work properly together with each other or with other processes in the client. That may be because the project interface designers in client failed to completely understand and fully specify all the interactions between the processes during the design phase. In addition, since different vendors are responsible for different processes, they would not communicate with one another. The inability of the client firm and its different suppliers' network to integrate or transfer tacit knowledge through available communication and coordination mechanisms can result in a costly and unsuccessful outsourcing strategy.

On the other hand, the client may encounter knowledge misappropriation hazards if the exposure of much proprietary knowledge about the client firms' idiosyncratic business practice, procedures, and supporting technologies required to be integrated in the outsourcing alliances through extensive communication and knowledge sharing (Brusoni, Prencipe, and Pavitt 2001; Ethiraj et al. 2005). A common way to mitigate knowledge misappropriation hazards is to manage the alliance structure and processes (Kumar and Seth 1998). However, such effort hinders the accomplishment of alliance goals because of the reduced communication and information sharing (Millar et al.1997). A feasible solution to mitigate knowledge misappropriation hazards while simultaneously achieving the intended alliance goals would be to integrate all the tacit knowledge within independent processes and encapsulation firm-specific knowledge as standardized interfaces, i.e. modularization of the outsourced business process (MOBP) (Tiwana 2008a).

As an evolutionary outsourcing strategy, modularization of outsourced business process (MOBP) is an operational concept of "modular global sourcing" proposed by Infosys (Infosys 2007), a leading Indian vendor. Modular global sourcing allows an enterprise to adopt best-of-breed sourcing strategies and achieve greater flexibility. Just as Ms Rita Terdiman, Vice-President of research at Gartner, said, "There is a driving need for enterprises to evolve their approach to outsourcing", "They need best of breed capabilities as well as the flexibility to embrace strategic modification. Bringing together modularization with global sourcing fulfils enterprises' such needs." (Infosys 2007). At project level, through well defined and standardized interface specifications, MOBP can reduce interdependence between the clients and the vendors, and largely lowers transaction costs and negotiation costs associated with outsourcing. Amazon.com, ebay, and Google, for example, have established successful outsourcing alliance

portfolios without of much normal control and thus with less outsourcing costs, because of the high degree of modularity of the outsourced projects (Schonfeld, 2005; Tiwana, 2008b).

The purpose of this paper is to examine in the context of BPO the antecedents of modularization of outsourced business process (MOBP) and its implications from the view of a client firm based on transaction cost economics theory and knowledge-based theory at the project level. We suppose when the client firm makes outsourcing decision, the strategy of modularization of the outsourced business process is under consideration. The context of our study is that after deciding to adopt modular outsourcing, the firm will modularize the business process to outsource by itself and in its implementation of MOBP, many factors will affect the actual extent of MOBP, the extent of MOBP having significant influence on outsourcing outcomes.

To our knowledge, although some research has been conducted on modularity in ITO and BPO, most of this research has focus on the impacts of modularity and supposed modularity has existed already. Miozzo and Grimshaw (2005) challenged the general claim that modularity stimulated innovations in the outsourcing of knowledge-intensive business services. Tiwana (2008a,b) explored the impacts of modularity on knowledge sharing and control in software outsourcing alliances and suggested that modularity lowers the need for knowledge sharing and complemented vendor's ignorance of client's organizational knowledge (Tiwana 2008a) and that modularity could substitute process control but not outcome control (Tiwana 2008b). Tanriverdi et al. (2007) indicated that business process modularity reduces transaction, coordination and production costs and has significant impact on the choice of sourcing mechanisms. To accomplish business process flexibility in an enterprise, Fang and Liu (2008) introduced the concept of business process modularity and uncovered the antecedent of modular process design. However, their research context is different from that of this paper, BPO. To our knowledge, research has yet to explore the implications of modularization in the context of BPO. Thus, our primary contribution is to uncover what factors contribute to or impede the modularization of outsourced business process (MOBP) from the client's view, and understand how the extent of MOBP affects transaction cost, flexibility and knowledge spillover. The unit of analysis is knowledge-intensive business process which the client firm considers to outsource. The underlying logic of our research is transaction cost economics theory and knowledge-based theory.

The rest of this research-in-progress paper proceeds as follows. The next section is theoretical background, followed by the development of research model and hypotheses. In the fourth section, we lay out a research plan to test the research hypotheses. Finally there is a concise conclusion and the contribution of this paper has been highlighted.

Theoretical Background

Modular design for Business Processes

Modular system theory is a design approach to complex organizational and technological systems and has been proposed for firms to adapt to dynamic markets (Worren, Moore and Cardona 2002). Sanchez and Mahoney (1996) found that product and organizational modularity reduces the cost and difficulty of adaptive coordination and thus increases firms' strategic flexibility in organizing product development and utilizing a network of component capabilities from other organizations. The principle of modular system design can be applicable to any complex system which can be decomposed into loosely connected components that are coordinated by standard interfaces, such as product design, information technology architecture, organizational design and processes design (Oshri and Newell 2005; Sanchez and Mahoney 1996).

Business processes modularity refers to the looseness of coupling between business processes in a firm (Sanchez and Mahoney 1996). A business process is a group of actions and resources with clear function that produces output for customers. A firm is a combination of several business processes that interact with each other to accomplish various organizational goals and defines its system structure, including how to divide the required functionality among processes, where to perform the processes, how to achieve communication and coordination among them, and how to put their outcomes together without loss of functionality (Tanriverdi et al. 2007). Modular design for business processes has three components: architecture, interface and standards. The architecture defines the blueprint of the organizational system: what processes it has and what functionality they perform. Interfaces clarify how business processes work together and communicate with each other. Standards ensure processes conform to interface specifications and achieve certain performance requirements. A process modular has well defined functions, interfaces and performance specifications. The dependence is low in a process module and higher between process modules. Thus, process modules have features of 'encapsulation' and 'plug-and-play' (Fang and Liu 2008).

Modular business process architecture and its supporting IT architecture enable firms easily to obtain some process modules from outside vendors without losing functionality (Tanriverdi et al. 2007). Popular techniques and tools such as Business Process Management (BPM) and Service-Oriented Architecture (SOA) can help firms implement standardization and modularization of business process management, and achieve on-demand configuration of processes and services.

Modularization of Outsourced Business Process

As globalization of competition, in practice, modularization and outsourcing, though remaining conceptually distinct, tend to become increasingly inseparable. Modular product and process design enables firms to outsource and benefits from the competition of suppliers (Baldwin and Clark 2000). Modular outsourcing enables a firm to choose most suitable partners for it because of a larger source of module service providers and also reduces transaction costs, negotiation costs and production costs associated with outsourcing (Tanriverdi et al. 2007).

Since the context of this study is business process outsourcing, we use Tanriverdi et al. (2007)'s definition of business process modularity to define our core concept---modularization of outsourced business process (MOBP), which is defined as the effort that a business process is been made loosely coupled, and standardized enough to be separated from other business processes, executed independently, and recombined without loss of functionality (Tanriverdi et al. 2007). The concept of MOBP emphasizes that our focus is the modularization of the business process a client firm considers to delegate or has delegated to a vendor, not the modular design for the business processes in a client firm. The extent of MOBP is said high when the interfaces and performance specifications of the business process are standardized and well defined, and the vendor is given more responsibility and autonomy to execute the process. On the contrary, when the interfaces and the performance specifications are unstable, incomprehensive and ambiguous, and the vendors have limited autonomy and the method and the client firms have the particular requirement on the tools, equipments and technology to perform the business process, the extent of MOBP is viewed lower.

In our context, the concept of MOBP is the microcosmic or operational concept of modular outsourcing and modular global sourcing. These concepts all deals with modularization of a certain object. Modular outsourcing has been popular in such manufacture industries as auto industry and electronics industry. In BPO, modular global sourcing and modular menu outsourcing service proposed respectively by Inforsys, a leading Indian provider and Founder Technology, a noted Chinese provider have the same meaning of modular outsourcing. In fact, there are many outsourcing alliances which have adopted or are adopting modularization strategy.

MOBP is an attempt to reduce the complexity associated with managing the tacit knowledge embedded in the interfaces between the vendor and the client and endow the client with more flexibility to make sourcing choice by integrating the tacit knowledge at the module/vendor level (Langlois 2000). Managerial decision embrace modularization strategy in the practice of BPO can be driven by several motivations: (1) to save substantial costs and reduce complexity associated with managing the interfaces through modularized and standardized interfaces and performance specifications, (2) to acquire best of breed capabilities and best practices of the industry from the vendors, (3) to adapt to the institutional and market environments, such as client firm demand, intensive competition, and requirements of professional associations. The extent of MOBP in practice is affected by many factors related to the specific process, such as asset specificity, technical complexity, and vendors' expertise, etc. MOBP can be implemented only by the client or through the cooperation of the client and the vendor. It depends on the client firm's heterogeneously technical capabilities and modularization complexity. In the recent years, modular sourcing and services have been proposed and is the current trend in global sourcing, and many vendors would help their clients implement the modularization of business processes at the outset of alliance. MOBP can be realized by specifying the attachment (how they fit together), information exchange and interactions between the outsourced process and other processes of a client firm at the outset of the alliance (Tiwana 2008a).

Modular outsourcing enables competitors to more easily imitate the advantages created by the outsourced process though the same vendors, however, the overall business process architectures (i.e. the sheer number of processes and the connections among them) of a firm are difficult to observe, decipher and imitate (Tanriverdi et al. 2007), due to their historical dependence, causality ambiguity and complexity. Therefore, firms need not only develop and properly manage a portfolio of relationships with external vendors, but focus on the design, management, and continuous renewal and update of their business process architectures (Tanriverdi et al. 2007). Both abilities are becoming important sources of competitive advantages in the era of intensive outsourcing practices.

Research Model and Hypotheses

Since modularization in BPO is an important trend, this paper develops a model from the perspective of a client firm, in Figure 1 which captures the factors affecting the extent of MOBP in the practice of BPO based on TCE theory and knowledge-based theory, and what effects of the extent of MOBP on cost reduction and knowledge spillover.

Antecedents of MOBP from Transaction Cost Economics Theory

The roots of TCE date back to Coase (1937) who argued that firms exist because using the market is costly. This basic argument has been picked up by Williamson (1975, 1985) in his development of TCE. The main objective of TCE is to identify the conditions under which market governance (e.g., outsourcing) is more cost efficient than governance within the boundaries of a firm (i.e., insourcing). Thus, the main focus of TCE is on minimizing transaction costs, which can be defined the direct and indirect expenses of negotiating, monitoring, and enforcing explicit and implicit contracts between firms. According to TCE, Transaction costs are proposed to depend on various contingencies, such as asset specificity, uncertainty, frequency and small-number trading (Williamson 1981). These transaction characteristics have different impacts on the degree of the motivation and the complexity of implementing modularization in BPO. Considering the motivation of MOBP is to reduce the transaction costs associated with outsourcing, we argue whatever the frequency of an outsourcing transaction is, firms have high motivation to adopt MOBP. In other words, the MOBP has no significant relationship with the frequency of an outsourcing transaction. Next, we will analyze the relationship of process asset specificity, enviromental uncertainty, behavioral uncertainty and small-number trading and the extent of MOBP.
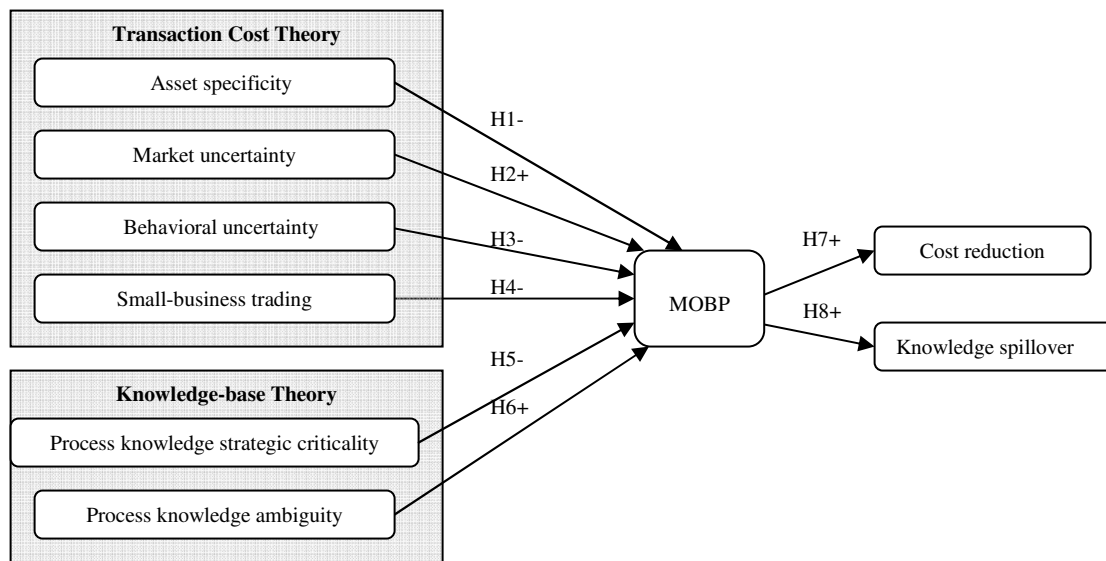

Figure 1   Antecedents and Consequences of MOBP in BPO

Asset Specificity

There exist three common forms of business process asset specificity, physical asset specificity, human asset specificity and procedural asset specificity (Fang and Liu 2008). Research results show that human investments are usually substantial and important costs for accomplishing business processes (Fang and Liu 2008; Rindfleisch and Heide 1997), so in our context we will focus on human asset specificity, which refers to the extent of human skills, knowledge and experience associated with a business process are firm specific and non-transferable to other uses (Fang and Liu, 2008; Tanriverdi et al. 2007).

 In BPO, if the provision of a business process requires knowledge that is very client-specific, the vendor has to invest a lot of time and resources in order to adopt this unique knowledge. According to TCE, this necessity increases the vendor's propensity to behave opportunistically, because such a specific investment would prevent the vendor from realizing economies of scale by using the same resources (employees and adopted knowledge) in other similar projects with the same industrial context. Opportunistic behavior could, for example, take the form of under-

investing in the project or using employees that were contracted for the client in other vendor accounts without informing the client. This behavior could result in low service and product quality (i.e., poor software quality) or project delays (Barney 1999, p.139). In order to safeguard against opportunistic behavior and its negative consequences, the client would not endow the vendor with more autonomy and flexibility, but invest in constantly monitoring both the vendor's process of performing the business process as well as the output (e.g., by checking the quality of the vendor's functional specifications or business process design, as well as intermediary releases). MOBP limits to well specifying the interfaces, thus the extent of MOBP is limited. Thus the higher the level of human asset specificity of the outsourced business process, the lower the extent of MOBP the client firm is likely to adopt. Therefore, we hypothesized:

H1: In BPO, human asset specificity of business process negatively affects the extent of MOBP.

Environmental Uncertainty

There are two forms of uncertainty: environmental uncertainty and behavioral uncertainty (Rindfleisch and Heide 1997; Slater and Spencer 2000). Environmental uncertainty refers to business or business environment-related ambiguity and can take two forms consisting of volatility and diversity of environment (Klein 1989; Klein et al. 1990). Environmental volatility undermines a company's ability to predict future outcomes (Klein et al. 1990; Leblebici and Gerald 1981). As firms have more difficulty writing market contracts that cover changed circumstances, partners may act opportunistically when circumstances change, which could cause companies to incur costs relating to communication, negotiation, and coordination (Klein et al. 1990; Rindfleisch and Heide 1997; Williamson 1975). Environmental diversity reflects the view that multiple sources of uncertainty exist in the environment (Aldrich 1979). While firms might try to keep up with the market, they may need to invest in highly specific asset to enable them to deal with complexity of innovative technology at a point in time. When the environment changes, however, this investment may cause them to persist with outdated technology, and their profitability may be reduced by the costs of managing them (Harrigan 1984; Rumelt 1974).

In BPO, in general, environmental uncertainty favors MOBP. As the result of MOBP, minimized interaction between the client and the vendor, well-specified interfaces and partners shield from inner working details make it easier to adapt to environment changes (Sanchez and Mahoney 1996). The changes within the process will not significantly influence the design or functions of other processes, because MOBP makes adaptation stays at the level of specifying interfaces, input/output structure and performance requirements. It is not so important for the client firm to specify how to execute the business process (Tanriverdi et al. 2007). Thus MOBP largely lowers the need for modifying interior design and resource deployment of the business process required by environmental changes and allows firms to exit quickly from a given transaction, reducing sunk costs. MOBP affectively protects the firm from the impact of environmental uncertainty. Higher environmental uncertainty, the more motivation the firm has to implement a higher extent of MOBP to reduce the influence of environmental uncertainty. We hypothesized:

H2: In BPO, environmental uncertainty positively affects the extent of MOBP.

Behavioral Uncertainty

The second type of uncertainty is behavioral uncertainty, which refers to the difficulty in evaluating the performance of a transacting party. It stems from the human element of the transaction, and the probability that even under conditions of information symmetry between the transacting parties, one or both may be unable or unwilling to implement the contractual terms. For example, exchange partners can use their own guile to create hidden costs by performing inefficiently and ineffectively (Rindfleisch and Heide 1997; Williamson 1985).

In BPO, when vendor's behavioral uncertainty is high, the firm faces high risk of opportunism. Thus, to a higher extent it must implement complex and costly governance mechanisms to safeguard its interests in its transactions with a vendor. The firm will not gave the vendor more freedom and responsibility through implementing MOBP, but closely control the executive details of the business process. Thus the firm may implement a limited extent of MOBP. It would only well define the interfaces and performance specification of the business process, not ignore the detail of the business process and the behavior of the vendor. The higher the level of behavior uncertainty the firm perceives a vendor have, the more control it will put on the alliance activities. We hypothesized:

H3: In BPO, vendor's behavioral uncertainty the firm perceives negatively affects the extent of MOBP.

Small-number Trading

According to transaction cost theory, an important source of transaction costs in outsourcing deals with the number of players in the marketplace who can conduct a given transaction (Chandra & Shankar 2004). In our context, we use the extent a transaction is a small-number trading as a proxy for the degree of outsourcing market maturity.

In BPO, when a transaction is a small-number trading, there is small number of the vendors who can perform a given business process in the market, and also small number of the client firms who have transaction requirement, and the regulations, rules and policies associated with the transaction are not sound, that is, the maturity of the outsourcing market is lower. The firm cannot easily find a competent partner and is also more difficult to find another suitable replacer when it is not satisfied with the service of the partner. And also, the ability of the firm to use the market as a tool for 'disciplining' and controlling the vendors is diminished (Williamson 1981). In this situation, the firm would face increased risk of opportunism. Moreover, as the number of the vendors in the market reduces, there is usually an increase in asset specificity, which increases the risk of opportunistic behavior as well as transaction costs.

To lower the risk of opportunism arising from the nature of small-number trading, the client firm has to closely control and monitor the details of performing the business process and the vendor's behavior, through developing entirely functional specification and detailed engineering, and giving limited tasks and responsibility. The vendor has to deploy the resource of business process and executive the process with the methods the client firm requires. Thus higher extent to which an outsourcing transaction is a small-number trading leads to a limited extent of MOBP. Generally, if the extent to which a transaction is a small number trading is very high, the technological level of the vendors existing in the market is very low, thus the client firm will not outsource the business process.

In BPO market with higher maturity, there are exists for certain intensive competition among them, which promotes standardization and commercialization of process outsourcing service (Mikkola 2003). The interface knowledge of the outsourced business process is standardized, well-documented and can be easily transferred. The client firm can easily modularize the business process and will endow more responsibilities and flexibility to perform the business process because of the higher competence of the vendors executing the business process independently. Therefore, the more mature the market for a outsourcing transaction, the higher extent of MOBP will be. We hypothesized:

H4: In BPO, the extent to which a transaction is a small-number trading negatively affects the extent of MOBP.

Antecedents of MOBP from Knowledge-based Theory

According to the knowledge-based theory of the firm perspective, firms are viewed as distributed repositories of tacit and explicit knowledge whose heterogeneous knowledge bases are the key determinants of sustained competitive advantage (Grant 2004; Nonaka 1994). Although the knowledge-based view emphasizes the unique knowledge of the client firm and its protection and preservation (Grant 1996), integration of such knowledge with that of the vendor is often necessary in the BPO alliances (Choudhury and Sabherwal 2003). Through encapsulating interior details and well defining the interface specifications, MOBP can effectively safeguard the proprietary knowledge of the firm. In the BPO, the motivation and the complexity of modularizing the business process to protect the knowledge vary among different business process because of the different characteristics of business processes: (1) the extent to which the knowledge of the business process is strategically critical; (2) the extent to which the knowledge of the process is mature, resulting in different extents of MOBP among different business process. Next, we will discuss the effects of the factors based on knowledge-based theory on the extent of MOBP.

Strategic Criticality of Process knowledge

Strategic criticality of process knowledge is defined as the extent to which the knowledge associated with the business process is perceived to be critical to the firm's survival, rare among the firm's competitors and difficult to substitute and imitate by competitors (Barney 1991). We use it as a proxy for the degree of importance of the outsourced business process to the outsourcer's strategic development.

Higher strategic importance of business process to the firm's business drives the attempts to focus more attention on its evolvement and changes (Kirsch 1996). Thus when the outsourced business process is more strategically important, the outsourcer will more closely cooperate with the vendor and impose more control on the alliance activities to minimize the dangers of BPO, such as loss of internal know-how and control of the outsourced process, and the occultation of knowledge strategic implications for a time by real cost and service improvements (Willcocks, Hindle, Feeny and Lacity 2004). Thus the outsourcer will have less motivation to reduce the connections with its partner and increase the degree of MOBP. When the strategic importance of business process is very high, the client firm will not outsource it.

Moreover, the more important the business process is, the more effects its internal design changes will have on the functionality of other processes in the firm, which makes process modularization more difficult and complex. The motive of the outsourcer to modularize such business process is lower. Therefore, when the strategic importance of the outsourced process deemed by the outsourcer is higher, the outsourcer will have lower incentive to modularize the processes and make the degree of MOBP higher because of the higher incentive to control the alliance activities and the difficulty and complexity of modularization. On the contrary, if the outsourced business process is thought to be less important to the outsourcer's business and survival, the outsourcer will have higher incentive to increase the degree of MOBP to reduce the outsourcing costs. Therefore, a higher degree of MOBP in BPO alliances is associated with a lower degree of strategic importance of the process perceived by the outsourcer. We hypothesize:

H5: In BPO, perceived strategic importance of the process has a negative effect on the degree of MOBP.

Process knowledge ambiguity

Knowledge ambiguity is defined as a lack of understanding of the logical linkages between actions and outcomes, inputs and outputs, and causes and effects that are related to technological or process know-how (Simonin 2004). Knowledge ambiguity is the extension of Lippman and Rumelt's (1982) concept of causal ambiguity, which is the basic ambiguity concerning the nature of the causal connections between actions and results. In this study, we use the ambiguity of process knowledge as a proxy for process maturity.

Maturity is an important necessary condition for business process modularization (Tanriverdi et al. 2007). Modularization of business process requires a high degree of formalization, codification and standardization, i.e. maturity (Worren et al. 2002). When the process is mature, the ambiguity of its knowledge is low. A mature process is characterized with well-established procedures, routinized operations and self-sufficient management, and there are seldom future changes in it (Tanriverdi et al. 2007). Thus the logical relation between inputs and outputs, and actions and outcomes of the process is unambiguous and can be described clearly, and the process knowledge is codified and documented, showing low ambiguity. Maturity enables the process to communicate and perform to stable and common rules and specifications shared by other processes, thus facilitates interfaces stabilization and standardization. This makes it easy to decouple the process from the value chain and source it from outside without much functional disturbance (Tanriverdi et al.2007). On the contrary, when the maturity of the process is lower, the knowledge ambiguity is high. With low maturity, the operational procedures, inputs, outputs, and supporting technologies of the process are not well-defined and still evolving, and frequent changes happen both in the process and other processes affected by it (Tanriverdi et al.2007). Thus it is difficult to set stable, standardized interfaces between the focal process and other processes. Therefore, the maturity of business process itself facilitates its modularization and increase MOBP. We hypothesize:

H6: In BPO, knowledge ambiguity of the outsourced business process negatively affects the extent of MOBP.

Consequences of MOBP

Cost reduction

Cost reduction refers to the amount of the costs reduction achieving by outsourcing through adopting MOBP relative to insourcing. The implementation of MOBP can largely reduce transaction costs, coordination costs and production costs associated with outsourcing, and thus achieve enormous cost reduction. MOBP aims to minimize the interdependence among the outsourced process and other processes, and make information and procedures to execute the outsourced business process largely encapsulated within it (Tanriverdi et al. 2007). After implementation of MOBP, the outsourced process can works autonomously without consulting, interacting and exchanging with other processes too much. The changes within it will not significantly affect the design or the functions of other processes. Therefore, MOBP lowers the need for communication and knowledge sharing between outsourcer and vendor, largely lowering the hazard of opportunism and transaction costs, in that interfirm coordination relies more on the predefined specifications than managerial authority. MOBP implies low level of specificity and greatly relieves "maladaptation problem" in an arm-length relationship (Tanriverdi et al. 2007),

which is defined as "the haggling and friction" due to *ex post* changes and adaptations when contracts are incomplete (Tadelis 2002). In addition, due to the independence of the outsourced business process, the vendor is not necessary to adopt the same technological standards and equipments with that of the client firm, and this will reduce the production cost of business process(Tanriverdi et al. 2007). Therefore, the higher the extent of MOBP, the more cost reduction the firm will achieve. We hypothesized:

H7: In BPO, the extent of MOBP positively affects cost reduction in outsourcing.

Knowledge Spillover

Knowledge spillover is thought to be an inevitable result of alliance involvement (Inkpen 1998). Knowledge spillover is defined as the knowledge of the client firm lost to the vendor during an outsourcing alliance. The knowledge acquired from the client firm can be used by the vendor to enhance their own strategy and operations (Inkpen 1998) or reused in other projects for similar clients in the outsourcer's industry to reduce the production cost (Tiwana 2008a).

MOBP reduces the chances for knowledge spillover by encapsulating proprietary knowledge within interfaces of the outsourced process (Tiwana 2008a). Well-defined interface specifications reduce the volume and diversity of the information vendor needs to execute the process (Tanriverdi et al. 2007). Encapsulated functionality of the outsourced business process minimizes the interaction between the outsourcer and the vendor through making the outsourced process self-contained. Thus, MOBP lowers the need for knowledge sharing between outsourcer and vendor, and mitigates the risk of a firm losing its critical knowledge to a partner without receiving any benefits in return (Muthusamy and White 2005). On the contrary, when MOBP is lower, the process is less stand-alone and more interdependence with other processes and its internal design changes are likely to create a cascade of required changes in other processes (Tiwana 2008a). This requires the outsourcer to communicate more with the vendor to establish the interfaces together and more involved in the alliance activities. Thereby, a lower extent of MOBP leads to more knowledge sharing between outsourcer and vendor, and more firm-specific knowledge of outsourcer spilled over to the vendor. Therefore, the higher the extent of MOBP, the less knowledge will be spilled over to the vendor in the BPO alliance. We hypothesized:

H8: In BPO, MOBP negatively affects knowledge spillover.

Research Plan

Before testing the model, we would interview the managers and the staff associated with BPO in the client firms and the vendors to understand the factors in practice influencing the extent of MOBP. After revising the research model according to the results of the interview, we would test the hypotheses using survey method. Currently, we have collected scales and measures from previous studies in our literature review. We are making corresponding changes on these scales to adapt to the context of our study and will pretest the questionnaire with a pilot study. We have surveyed the relevant literature to measure the main construct, MOBP. We will use a six item, seven-point scale to measure MOBP from the aspects of stability and comprehensiveness of interfaces, interindependence, loosely coupling, easy assessment of the performance and interoperability with other processes, based on descriptions and measurements of MOBP in the modularity literature (Fang and Liu 2008; Mikkola and Gassman 2003; Tanriverdi et al. 2007; Tiwana 2008a, b).

The unit of analysis is the project dyad, since the level of modularity within the same relationship dyad can vary across different projects. Despite we build the research model from the outsourcing firm view, the data to measure knowledge spillover should also be collected from the vendors. Thus in the main data collection, we plan to survey BPO service providers and their clients in China. We will collect data from the clients to measure the constructs of easiness of process knowledge accessing, strategic importance of process knowledge, learning incentive, process maturity, MOBP and knowledge acquisition, and from providers to measure knowledge spillover. We have collected a preliminary list of the companies providing and receiving BPO services in China. We plan to use partial least squares or structural equation modeling to test the validity and reliability of measurement and research hypotheses.

Up to May 2009, there have existed 5,500 ITO and BPO providers in China, among which are some notable companies such as Neusoft, Dalian Xinhua Infotech, and China Data Group (Beijing). The service ability of these providers has improved dramatically and the service value chain is transferring from low-end to high-end. Chinese outsourcing service providers have already been dominant in Japan's and South Korea's ITO/BPO markets. Now they are trying to exploit ITO/BPO markets in the U.S. as well as the EU countries. Therefore, a study of China BPO will shed invaluable light to the research community of global sourcing and also a study of modularity to the study of outsourcing and inter-organizational learning and knowledge transfer.

Conclusion

This research-in-process paper introduces the concept of modularization of outsourced business process (MOBP). It enhances our understanding of what factors in the client firms leading to high extent of MOBP and what the influence of MOBP on transaction cost reduction and knowledge spillover. Studies on ITO and BPO have not resolved these problems. Standing the position of the client firms, we examine the antecedents and consequents of

MOBP based on transaction cost theory and knowledge-based theory. We explore the effect of transaction cost factors and process knowledge factors on the extent of MOBP and also that of the extent of MOBP on cost reduction and knowledge spillover. This research firstly explores the antecedents of modularization in outsourcing and would make great contribution to the research on BPO and modularity.

References

Almeida, P., Dokko, G., and Rosenkopf, L. "Startup size and the mechanisms of external learning: increasing opportunity and decreasing ability?" *Research Policy* (32), 2003, pp. 301-315.

Aldrich, Howard. Organizations and Environments, NJ., 1979, Prentice-Hall

Badaracco, J.L., The Knowledge Link, Boston, Harvard Business School Press, 1991.

Baldwin C. Y, Clark K.B., Design Rules,The power of modularity, Cambridge, MA, MIT Press, 2000.

Barney, J.B. "Firm resources and sustained competitive advantage," *Journal of Management* (17), 1991, pp. 99–120.

Bensaou, M., and Anderson, E. "Buyer–supplier relations in industrial markets: When do buyers risk making idiosyncratic investments?" *Organization Science* (10: 4), 1999, pp. 460-481.

Brusoni, S., Prencipe, A., and Pavitt, K. "Knowledge specialization, organizational coupling, and boundaries of the firm: Why do firms know more than they make?", *Administrative Science Quarterly* (46), 2001, pp. 597-621.

Choudhury, V., and Sabherwal, R. "Portfolios of control in outsourced software development projects". *Information Systems Research*, (14: 3),2003, 291-314.

Coase, R.H. "The nature of the firm", *Economica* (4), 1937, pp.386-405.

Cohen, W. M. and Levinthal D. "Absorptive capacity: A new perspective on learning and innovation," *Administrative Science Quarterly* (35: l), 1990, pp.28-152.

Conner, K., and Prahalad, C.K. "A Resource Based Theory of the Firm: Knowledge vs. Opportunism," *Organization Science* (7), 1996, pp. 477-501.

Eisenhardt, K.M., and Schoonhoven, C.B. "Resource-based view of strategic alliance formation: strategic and social effects in entrepreneurial firms," *Organization Science* (7:2), 1996, pp. 136-150.

Ethiraj, S. K., Kale, P., Krishnan, M. S., and Singh, J. V. "Where do capabilities come from and how do they matter? A study in the software services industry," *Strategic Management Journal* (26:1), 2005, pp. 25-45.

Fang, D., and Liu, J. "An empirical study of flexible business process based on modularity system theory," *The Third International Multi-Conference on Computing in the Global Information Technology*, Athens, Greece, July 2008, pp. 37-44.

Grant, R. "Toward a knowledge-based theory of the firm," *Strategic Management Journal* (17), Special issue, Winter 1996, pp. 109-122.

Gulati, R. "Does familiarity breed trust? The implications of repeated ties for contractual choice in alliances," *Academy of Management Journal*, (38:1), 1995, pp. 85-112.

Hamel, G., Doz Y. L., and Prahalad C. K. "Collaborate with your competitors-and win," *Harvard Business Review*, (67:1), 1989, pp. 133-139.

Hamel, G. *Competitive collaboration: learning, power and dependence in international strategic alliances*, Unpublished dissertation, The University of Michigan, 1990.

Hamel, G. "Competition for competence and inter-partner learning within international strategic alliances," *Strategic Management Journal* (12), Summer Special Issue 1991, pp. 83-103.

Harrigan, Kathryn R. "Formulating Vertical Integration Strategies", *Academy of Management Review*(9:4), 1984,pp.638-652

Howard, M., and Squire, B. "Modularization and the impact on supply relationships," *International Journal of Operations & Production Management* (27:11), 2007, pp. 1192-1212.

Inkpen, A. C. "Learning and knowledge acquisition through international strategic alliances," *Academy of Management Executive* (12:4), 1998, pp. 69-80.

Infosys, "Global delivery model," Retrieved January 6, 2007, from http://www.infosys.com/gdm/default.asp.

Jewkes, J., and Sawers, D. *The Sources of Invention*, Macmillan, London, 1958.

Kale, P., Singh, H., and Perlmutter, H. "Learning and protection of proprietary assets in strategic alliances: building relational capital," *Strategic Management Journal* (21:3), 2000, pp. 217-237.

Kapoor, R., and Adner, R. "What firms make vs. what they know: how firm boundaries affect competitive advantage," *Academy of Management Proceedings*, 2008, pp. 1-6.

Kirsch, L. "The management of complex tasks in organizations: Controlling the systems development process," *Organization Science* (7:1), 1996, pp.1–21.

Klein, Saul. "A Transaction Cost Explanation of Vertical Control in International Markets", *Journal of the Academy of Marketing Science*, (17:3), 1989,pp.253-260.

Klein, Saul, Frazier, Gary L. and Roth, Victor. J. "A Transaction Cost Analysis Model of Channel Integration in International Markets", *Journal of Marketing Research*, (27:2), 1990, pp.196-209.

Ko, D. G., Kirsch, L. J., and King, W. R. "Antecedents of knowledge transfer from consultants to clients in enterprise system implementations," *MIS Quarterly* (29:1), 2005, pp. 59-85.

Kumar, S., Seth, A. "The design of coordination and control mechanisms for managing joint venture- parent relationships," *Strateg Manage J* (19:6), 1998, pp. 579-599.

Lane, P. J., and Lubatkin, M. "Relative absorptive capacity and interorganizational learning," *Strategic Management Journal* (19:15), 1998, pp. 461-477.

Langlois R. N. "Modularity in Technology, Organization and Society", paper presented at the conference on *Austrian Economics and the Theory of the Firm*, Copenhagen Business School, August, 1999, pp.16-17.

Leblebici, Huseyin and Gerald, Salaneik. "Effects of Environmental Uncertainty on Information and Decision Process in Bank", *Administrative Science Quarterly* (26:4), 1981, pp.578-296.

Levina, N., and Ross, J. "From the vendor's perspective: Exploring the value proposition in information technology outsourcing," *MIS Quarterly* (27:3), 2003, pp. 331–364.

Lippman, S. A. and Rumelt R. P. "Uncertain imitability: An analysis of interfirm differences in efficiency under competition," *Bell Journal of Economics* (13), 1982, pp. 418-438.

Lyles, M. A., and Salk, J. E. "Knowledge acquisition from strategic parents in international joint ventures: an empirical examination in the Hungarian context," *Journal of International Business Studies* (27:5), 1996, pp. 877-904.

Mehta, A., Armenakis, A., Mehta, N., Irani, F. "Challenges and opportunities of business process outsourcing in India", *Journal of Labor Research*(XXVII:3), 2006, pp.324-38.

Mikkola, J., and Gassman, O. "Managing modularity of product architectures: toward an integrated theory," *IEEE Transactions on Engineering Management* (50:2), 2003, pp. 204-218.

Mikkola, J. H. "Modularity, componet outsourcing, and inter-firm learning," *R&D Management* (33:4), 2003, pp. 439-454.

Millar, J., Demaid, A., and Quintas, P. "Trans-organizational innovation: a framework for research," *Technol Anal Strateg Manag* (9:4), 1997, pp. 399- 418.

Miozzo, M., and Grimshaw, D. "Modularity and innovation in knowledge- intensive business services: IT outsourcing in Germany and the UK," *Research Policy* (34: 9), 2005, pp. 1419-1439.

Muthusamy, S. K., and White, M. A. "Learning and knowledge transfer in strategic alliance: A social exchange view," *Organization Studies* (26:3), 2005, pp. 41-441.

Norman, P. M. "Knowledge acquisition, knowledge loss, and satisfaction in high technology alliances," *Journal of Business Research*, (57:6), 2004, pp.610-619.

Nonaka, I. "A dynamic theory of organizational knowledge creation," *Organizational Science* (5), 1994, pp. 14-37.

Oshri, I., and Newell, S. "Component sharing in complex products and systems: Challenges, solutions, and practical implications," *IEEE transactions on engineering management* (52:4), 2005, pp. 509-521.

Oxley, J. E. "Institutional environment and the mechanisms of governance: the impact of intellectual property protection of the structure of inter-firm alliances," *Journal of Economic Behavior Organization* (38:3), 1999, pp. 283-309.

Pennings, J. M., and Harianto, F. "The diffusion of technological innovation in the commercial banking sector," *Strategic Management Journal* (13), 1992, pp. 29-46.

Rindfleisch, Aric and Heide, Jan B. "Transaction Cost Analysis: Past, Present, and Future Applications", *Journal of Marketing*, (61:4), 1997, pp.30-54.

Rosenkopf, L., and Nerkar, A. "Beyond local search: boundary-spanning, exploration, and impact in the optical disc industry," *Strategic Management Journal* (22:4), 2001, pp. 287-306.

Rumelt, R. P. "Strategy, Structure, and Economic Performance", *Harvard University*, MA, 1974.

Sanchez, R., and Mahoney, J. T. "Modularity, flexibility, and knowledge management in product organization and design," *Strategic Management Journal* (17)*,* Winter Special Issue 1996, pp. 63-76.

Schilling, M. A., and Steensma, H. K. "The use of modular organizational forms: an industry-level analysis," *Academy of Management Journal* (44), 2001, pp. 1149-1168.

Schonfeld, E. "The Great Giveaway," *Business 2.0*, April 2005, pp. 81–86.

Shenkar, O., and Li, J. "Knowledge search in international cooperative ventures," *Organ Sci* (10:2), 1999, pp. 134-143.

Simonin, B. L. "Ambiguity and the Process of Knowledge Transfer in Strategic Alliances," *Strategic Management Journal* (20), 1999, pp. 595-623.

Simonin, B. L. "An empirical investigation of the process of knowledge transfer in international strategic alliances," *Journal of International Business Studies* (35), 2004, pp. 407-427.

Slater, Gary and Spencer, David. "The Uncertainty Foxindation of Transaction Costs Economics", *Journal of Economic Issues*, (34:1), 2000,pp.61-87

Stone, L. "New BPO definitions clarify service offerings," *Research Note*: *Gartner Research*, 2004, Document G00123758, <www.gartner.com>.

Tanriverdi, H. P., Konana, L., and Ge. "The Choice of Sourcing Mechanism for Business Processes," *Information Systems Research* (18:3), 2007, pp. 280-299.

Tadelis, S. "Complexity, flexibility, and the make-or-buy decision", *American Economic Review*(92:2), 2002, pp.433-437.

Tiwana A. "Does interfirm modularity complement ignorance? A field study of software outsourcing alliances," *Strategic Management Journal* (29), 2008, pp. 1241-1252.

Tiwana A. "Does Technological modularity substitute for control? A study of alliances performance in software outsourcing," *Strategic Management Journal* (29), 2008, pp.769-780.

Tiwana, A., and Keil, M. "Does peripheral knowledge complement control? An empirical test in technology outsourcing alliances," *Strategic Management Journal* (28:6), 2007, pp. 623–634.

von Hippel, E., and Tyre, J. M. "How learning by doing is done: problem identification in novel process equipment," *Research Policy* (24), 1994, pp. 1-12.

Willcocks, L., Hindle, J., Feeny, D., and Lacity, M. "IT and business process outsourcing: the knowledge potential," *Information Systems Management*, 2004, pp.7-13.

Williamson, O.E. Markets and Hierarchies: Analysis and Antitrust Implications. Free Press, New York, NY. 1975.

Williamson, O. E. The economics of organization: The transaction cost approach. *American Journal of Sociology* (87:3), 1981, 548-577.

Williamson, O.E.. The Economic Institutions of Capitalism. The Free Press, New York, NY. 1985.

Wipro, "Enterprise management," Retrieved January 6, 2007, from http://www.wipro.com/webpages/itservices/industries/utilities/enterprise_mgmt.htm

Worren, N., Moore, K., and Cardona, P. "Modularity, strategic flexibility, and firm performance, A study of the home appliance industry," *Strategic Management Journal* (23:12), 2002, pp. 1123-1140.

Nonaka, I. "A dynamic theory of organizational knowledge creation" *Organization Science*, (5:1), 1994, pp.14-37.

Yang, D.H., Kim, S., Nam, C. and Min, J.W. "Developing a decision model for business process outsourcing, " *Computers & Operations Research*(34), 2007, pp.3769-3778.